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13. ABSTRACT *(Maximum 200 words)*

Three areas have been investigated: (1) application of esr spectroscopy and time-resolved diffuse reflectance absorption and emission spectroscopy to establish mechanisms in photocatalytic oxidative degradations of organic molecules; (2) exploration of controlled oxidation chemistry for new heteroatom-containing organic molecules; and (3) synthesis and characterization of new quantized semiconductor-support systems. Sufficient work was completed to demonstrate that photocatalytic oxidation on irradiated semiconductor surfaces is a useful route for degradation of various organic materials under constrained, highly controlled conditions.

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Final Report on Surface-Mediated Photocatalysis

ARO Proposal No. 28298-CH

Work from 29/3/91 to 28/2/92

Contract No. DAAL03-91-G-0103

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Statement of Problem:

Three areas have been investigated: (1) application of esr spectroscopy and time-resolved diffuse reflectance absorption and emission spectroscopy to establish mechanisms in photocatalytic oxidative degradations of organic molecules; (2) exploration of controlled oxidation chemistry for new heteroatom-containing organic molecules; and (3) synthesis and characterization of new quantized semiconductor-support systems.

Summary of Most Important Results:

The objectives of this project have only been partially accomplished since funding could not be continued beyond the initial nine months, instead of the requested three years. Nonetheless, sufficient work was completed to demonstrate that photocatalytic oxidation on irradiated semiconductor surfaces is a useful route for degradation of various organic materials under constrained, highly controlled conditions.

List of All Publications and Technical Reports:

"A Comparison of the Physical Properties of Polypyrrole Produced by Anodic Oxidation and by Photoelectrochemical Activation of TiO_2," Marye Anne Fox and Karl L. Worthen, *Chem. Mater.* **1991**, *3*, 253.

"Surface Photodeposition of Metal Oxides by Decomposition of Several Group IVA Organometallics (Benzyltrimethylsilanes and -stannanes) on TiO_2," Maria T. Dulay, Debra Washington-Dedeaux, and Marye Anne Fox, *Photochem. Photobiol. A.: Photochem.* **1991**, *61*, 153.

"Photodegradation of Benzamide in TiO_2 Aqueous Suspensions," Catherine Maillard, Chantal Guillard, Pierre Pichat, and Marye Anne Fox, *New J. Chem.*. **1992**, in press.

"Cadmium Benzenethiolate Clusters of Various Size: Molecular Models for Metal Chalcogenide Semiconductors," Thomas Türk, Ute Resch, Marye Anne Fox, and Arnd Vogler, *J. Phys. Chem.* **1992**, in press.

"Spectroscopic Studies of Zinc Benzenethiolate Complexes: Electron Transfer to Methyl Viologen," Thomas Türk, Ute Resch, Marye Anne Fox, and Arnd Vogler, *Inorg. Chem.* **1992**, in press.

Two progress reports submitted to ARO covering 1/1/91-30/6/91 and 1/7/91- 31/12/91 respectively.

List of Participating Scientific Personnel and Degrees Obtained:

Maria Dulay, David Breslin: graduate students
Dr. Kate Doan, Dr. Jon Merkert: postdoctoral fellows

Reportable Inventions: None